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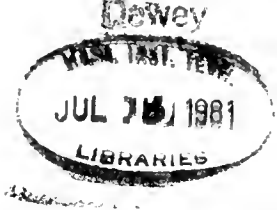






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DIVERSIFICATION AND PROFIT PERFORMANCE  
IN THE FOOD PROCESSING INDUSTRY

Krishna Gour Palepu

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INTRODUCTION

Diversification strategy is an important component of strategic management of a firm. Literature in management as well as industrial organization theory leads us to believe that economic performance and diversification strategy of a firm should be related. Much of the empirical evidence in the literature, however, fails to provide conclusive support to this notion.

Whether or not diversified firms are better performers, it is clear that more and more firms are pursuing diversification strategies. Data provided by Rumelt(1974) shows that while in 1949 only about thirty percent of the Fortune 500 U.S. corporations were non-single businesses, in 1969 over ninety percent pursued some form of diversification. In the light of such overwhelmingly prevalent practice, the question of the relationship of diversification to economic performance is of considerable interest to students of management.

The purpose of the present paper is to take a fresh look at the relationship between diversification and firm performance drawing upon empirical evidence from a sample of firms in the Food Products industry. In the

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following section, we shall first present the theoretical expectations on diversification and profitability. Section three deals with the issues related to the measurement of corporate diversification. In section four, a brief review of the empirical literature dealing with the relationship between diversification and profitability will be presented. The hypotheses examined in this study and the statistical analysis are described in section five. The last section consists of a discussion of the findings of the present study and the conclusions therefrom.

#### DIVERSIFICATION AND PROFITABILITY: THEORY

One of the early management theorists that studied diversification was Alfred Chandler. In a historical analysis of seventy of America's largest corporations, Chandler(1962) noted that many firms moved into new industries from their original product-markets in order to better employ their existing productive resources as the primary markets declined. Thus Chandler viewed diversification as a means through which firms attempt to maintain or improve their performance in the presence of a decline of their current businesses.

Economic theory, as well as management theory, indicate

that a diversified firm should be able to attain better economic performance than that of a less diversified or non-diversified firm. It is this belief that led many economists to be concerned about the impact of increasing conglomeration on competitive market forces. Markham(1973), in his study on conglomerate enterprises and public policy implications, suggests that the reason behind the expectation of higher profitability of a diversified corporation is its ability to acquire and exercise market power (pp.24-46). Because of its market power, the diversified firm is believed to be able to subvert the competitive market forces through mechanisms like cross-subsidization, reciprocity in buying and selling, predatory pricing and barriers to entry. A firm engages in cross-subsidization when it employs the revenues earned in one productline to support the activities pertaining to another. Predatory pricing is a similar mechanism, whereby a firm, as a strategic weapon against competition, uses the revenues earned on some product divisions to 'subsidize' the lower prices of others. Reciprocity in buying and selling occurs when a firm's actual and potential customers are also actual or potential suppliers. It is believed that the more diversified a company, the larger will be the number of markets in which it buys and sells and hence, the larger is the likelihood of opportunities to practise reciprocity.

Barriers to entry is a structural phenomenon of an industry. It has been claimed by economists that entry of large diversified firms into industries previously populated entirely by small undiversified firms sets the stage for rising concentration in the acquired firm's industry.

Another mechanism that might lead to supernormal profits of diversified companies is the 'information loss' arising from consolidated reporting by diversified firms. Microeconomic theory argues that the existence of supernormal profits in an industry will, ceteris paribus, induce new entry. Loss of profit information due to consolidated reporting by diversified firms inhibits this process as it does not indicate the profitability of specific productlines of the firm and this raises barriers to entry, thus, helping sustain supernormal profits for a considerably longer time. The recent change in reporting requirements, which will be discussed later, have reduced this information loss problem considerably.

Management theorists cite several reasons other than possible subversion of competitive market forces for a diversified firm's ability to attain higher profits. Synergy, economies of scale, efficiency in resource allocation, opportunity to exploit particular skills

like superior management strength, superior research and development capabilities are factors that enable diversified corporations to improve their performance. The effect which can produce a combined return on the firm's resources greater than the sum of its parts is referred to as synergy. Ansoff(1975) refers to several types of synergy that might result when a firm takes care to select its products and markets in a systematic manner. Sales synergy results from products using common distribution channels or common sales administration; operating synergy results from better utilization of facilities and personnel; investment synergy occurs from joint use of plant, common raw materials and transfer of know-how from one product to another; management synergy results from the ability to utilize the superior general management skills across products. Salter and Weinhold (1978) mention several ways through which diversification strategies might result in better economic value for a firm. They argue that a diversifying acquisition allows a company to apply the particular skills and knowledge of one partner to solve the problems and exploit the opportunities facing the other; that diversified companies can channel cash from units with surplus cash to units with current operating deficit but with promising future potential; that due to the portfolio effect, the diversified firm can reduce its overall

risk and hence lower its cost of capital. Another line of reasoning for expecting diversified firms to perform better than non-diversified ones is that a firm can be expected to undertake new activities rather than grow within the scope of its existing product structure only if the former alternative promises a higher prospective return.

To conclude, then, both management literature and economic theory suggest that diversification should bring superior performance to business firms.

#### MEASUREMENT OF DIVERSIFICATION: STATE OF THE ART

The method used to measure diversification is the basic determinant of the validity of any diversification study. A number of measures of diversification, both quantitative and qualitative, have been proposed and used by several researchers. In this section, we shall present a brief discussion of the issues related to the measurement of diversification, and discuss the relative merits of the various approaches.

Gort (1962) was one of the earliest researchers in the field of enterprise diversification. He defined diversification as the degree of heterogeneity of output of a firm, from the point of view of the number

of markets served by that output. Borrowing the concept of elasticity of demand from economics, he specified that two products belong to separate markets if their cross-elasticity of demand is approximately zero.

As Gorecki (1974) pointed out, any summary measure of diversification should take into account two dimensions of this heterogeneity - (i) the number of markets in which the enterprise operates and (ii) the relative importance of each of the markets in the total output of the enterprise. Several measures have been developed by researchers in an attempt to capture these two dimensions.

Gort proposed and employed three measures in his study on diversification and integration in American industry. The simplest of these was a count of the number of industries in which the company produced and sold goods and services. Another simple measure of diversification proposed by him was the complement of the ratio of primary industry output to total output of the enterprise (which is also known as the specialization ratio in industrial organization literature). Both these measures, however, suffer from severe limitations. The former fails to take into consideration the relative magnitudes of the outputs in

various industries. The latter does not take into account the composition (both in terms of the number of industries and their relative magnitudes) of the nonprimary industry output. With a view to counter these weaknesses, Gort proposed a third measure which was a composite of the above two. It was derived by multiplying the complement of primary industry specialization ratio by the number of industries in which the enterprise operated. Though more refined than the other two measures, Gort's composite measure of diversification also fails to fully account for the composition of the firm's nonprimary output.

Berry(1971) and McVey(1972), independently, attempted to remedy this weakness of Gort's measure by deriving an index of diversification by applying the weighting system used in the Herfindahl Summary Index of industry concentration, a measure widely used in industrial organization research. The Herfindahl measure was defined as

$$H = 1 - \sum_{i=1}^N P_i^2$$

where,  $P_i$  is the proportion of the enterprise's output classified in the  $i$ th industry and  $N$  is the total number of industries in which the industry operates. The relative importance of the various products in the



firm's total output is thus taken into consideration by weighting the share of each product by itself.

The Herfindahl concentration index has been widely used and hence historically the Bureau of Census data has been available for it. Due to this easy availability of data and because of its bounded properties, ease of understanding and intuitive appeal, the Herfindahl diversification index too has become quite popular with researchers.

In most of the studies on diversification employing the above indexes, products were identified as belonging to separate markets on the basis of the Standard Industrial Classification (SIC) code. This was because, as a practical matter, most of the publicly available data was cast in the mould of SIC codes. The choice of the level of industry detail, namely, 2-, 3-, or 4-digit level was however, left to the researcher.

Jacquemin and Berry (1979) pointed to one serious limitation of the Herfindahl index. As 2-digit level SIC classification of industries is essentially an aggregation of the finer classification at the 4-digit level, one might be interested in knowing the extent of diversification of a firm due to its diversification

across the broader 2-digit industry groups as opposed to the diversification within one 2-digit industry group across some-what related 4-digit industries. The Herfindahl index, because of the way it is calculated, cannot be decomposed into additive elements which define the contribution of diversification at each level of product aggregation to the total diversification of the firm. For example, the average value in 1960 of the Herfindahl index across 2-digit industry groups for 460 large manufacturing firms as calculated by Berry (1975) was 0.379. The average value of the index across 4-digit industries, for the same firms in the same year was 0.645. The latter was much larger than the former not merely because it was at a finer level of classification; there was double counting in computing the latter because some diversification at the 4-digit level is a consequence of diversification at the 2-digit level. It is not possible, using the Herfindahl index, to calculate separately, what the contribution to the total diversification was, of the diversification purely at the 4-digit level within each of the 2-digit level industries. In the scheme of SIC classification, as 4-digit industries within a 2-digit industry group are more closely related to one another than 4-digit industries across different 2-digit industry groups are, clearly, diversification at the 4-digit level

within a 2-digit industry group can be viewed as 'related diversification' in contrast with diversification across 2-digit groups which is relatively 'unrelated.' The Herfindahl index fails to provide measures of the two types of diversification - related and unrelated - separately.

Jacquemin and Berry (1979) proposed an entropy measure of diversification to overcome this limitation of the Herfindahl index. The entropy measure, which was first developed from the concept of entropy borrowed from physics, also has its origins in the industrial organization research where, it was used as a measure of industry concentration. Jacquemin and Berry modified the index for measuring corporate diversification. It is defined as follows:

Consider a firm operating in  $N$  4-digit industries. These  $N$  4-digit industries in turn aggregate into  $M$  2-digit industry groups (where  $M$  is obviously less than or equal to  $N$ ).

Let

$O_{ij}$  = Output of the firm in the  $j$ th 4-digit industry within  
 $i$ th 2-digit industry group,

$O_i = \sum_{j \in i} O_{ij}$  = Output of the firm in the  $i$ th 2-digit group

$O = \sum_i O_i =$  Total output of the firm,

$P_{ij} = O_{ij}/O_i,$

$P_i = O_i/O,$  and

$P_j = O_j/O$

The entropy measure of diversification at the 4-digit level within the 2-digit industry group  $i$  is defined as

$$D_{wi} = \sum_{j \in i} P_{ij} \cdot \ln(1/P_{ij})$$

The entropy measure of diversification across 2-digit groups is also similarly defined as

$$D_a = \sum_i P_i \cdot \ln(1/P_i)$$

The total diversification of the firm is defined as

$$D_t = \sum_j P_j \cdot \ln(1/P_j)$$

It can easily be shown, then, that the total diversification  $D_t$ , the within diversification  $D_w$ , and the across diversification  $D_a$ , as defined above, are related to each other as follows:

$$D_t = \sum_i P_i \cdot D_{wi} + D_a$$

The first term on the right hand side of the above

expression is a weighted average of the firm's 4-digit diversification within each 2-digit group in which the firm operates (each 2-digit group being weighted by its relative proportion  $P_i$  in the firm's total output). The second term is the firm's diversification across 2-digit industry groups. Thus the entropy measure enables one to decompose the total diversification into two components - a weighted average diversification within 2-digit industry groups, and diversification across 2-digit industry groups. If we define the diversification within 2-digit industry groups as the related diversification  $DR$ , and diversification across 2-digit groups as unrelated diversification  $DU$ , then we can write

$$DT = DR + DU$$

where  $DT$  is the firm's total diversification and

$$DR = \sum_i P_i \cdot D_{wi} \quad \text{and} \quad DU = D_a$$

As diversification across 2-digit groups takes a firm away from its present market much 'further' than does the diversification within a 2-digit group does, the implications of each type of diversification for corporate performance might significantly differ. Researchers were unable to study such implications due

to the inability of all indexes other than the entropy measure to provide such a distinction.

All the measure discussed above attempt to quantify the 'amount' of diversification of a firm. A different approach towards diversification was proposed by Rumelt (1974). He viewed diversification as a strategic move by a firm 'resulting from a balanced consideration of a firm's skills and resources, the opportunities extant in the economic environment, and the personal desires of management' (pp.10). Rumelt's definition of diversification strategy consists of two dimensions: '(i) the firm's commitment to diversity per se; (ii) the strengths, skills and purposes that span this diversity, demonstrated by the way new activities are related to old activities.' (pp.11). In an attempt to operationalize this definition, Rumelt adopted the classification system for diversified firms proposed by Wrigly (1970) and further refined it. Using a set of quantitative and qualitative criteria, he proposed nine categories of diversification strategies: single business, dominant vertical, dominant unrelated, dominant constrained, dominant linked, related constrained, related linked, acquisitive conglomerate, and unrelated passive. In his scheme of measurement, rather than being given a numerical index of diversification, each firm is placed in one of the nine

categories based on its diversification strategy. A summary of the criteria used by Rumelt in this scheme of classification is shown in the Appendix.

The method proposed by Rumelt differs from other measures of diversification in that it uses a mix of quantitative and qualitative criteria. As Rumelt (1974) pointed out, this approach brings mixed blessings :

While the use of this type of classification system permits the consideration of nonquantifiable data, the apparent preciseness of definite category boundaries must not obscure the fact that the researcher's judgement plays an important role in the technique. (In the present context) this type of semisubjective technique has several strengths ..... Ofcourse, these advantages are only obtained by sacrificing a degree of objectivity and replicability. (p.46)

#### DIVERSIFICATION AND PROFITABILITY: EMPIRICAL LITERATURE

Several researchers have attempted to examine the relationship between diversification and firm profitability at an empirical level. By and large, the findings of these studies have been inconclusive. In this section, we shall briefly review some of these studies.

One of the earliest studies in the area was conducted by Gort (1962). In an attempt to trace the history of diversification, the causes for its development, and the effect it had on size, growth and profitability of a firm, Gort analyzed statistical data covering 111 of the largest U.S. corporations over the years 1929, 1939, 1947, 1950, and 1954. Gort employed three different measures of diversification which were discussed in the earlier section. Profitability was measured as a ratio of average net income after taxes for the period 1947-1954 to average net worth for the same period. Measures of diversification were computed using data on employment and manufacturing payrolls drawn from U.S. Bureau of the Census (1958). Profitability measures were computed using data drawn from Moody's Industrials. The results of his analysis failed to produce evidence for any significant relationship between diversification and firm profitability. He found that profit rates for the 111 companies studied, during the period 1947-54 were correlated neither with diversification as measured in 1954 nor with change in diversification from 1947 to 1954. However, commenting on his results, Gort pointed that:

...this result must not be interpreted to mean that diversification exerted no influence upon the profitability of firms.



....numerous factors unrelated to diversification influence the rate of return in both primary and secondary industries (of a firm). The results, however, point to a conclusion that the influence of diversification upon profits is not, alone, sufficient to overcome other sources of variation in rates of return. (1962,p.77)

Arnould (1969) analyzed the relationship between diversification and profitability using a sample of 104 U.S. food processing firms. He defined diversification for the purpose of his study as movement from one 4-digit SIC industry into another. Four measures of diversification were constructed - the ratio of nonprimary output to total manufacturing output, the ratio of nonprimary to total output multiplied by the number of 4-digit industries in which a firm operates, summation of the share of the firm's output in each industry (at the 4-digit level) multiplied by the four-firm concentration ratio of that industry, and summation of the share of the firm's output in each industry multiplied by the share of the total output of the industry accounted for by the firm. The latter two indexes attempt to account for the structure of the industries entered by the firm while, the former two were the same as the ones used by Gort. Profitability was defined as the ratio of net profits to networth. As data on output were not directly publicly available, employment data from the 1963 census of manufacturers were used. Arnould, based on

the results of his analysis, could not conclude that diversified firms were more profitable than nondiversified firms or less diversified firms.

Commenting on his results, Arnould said:

The lack of any correlation between the measures of diversification and profitability does not permit the conclusion that diversification did not increase the level of profitability of individual firms. It must be interpreted to indicate that diversified firms tend to be no more profitable, at least as might be explained by a simple mathematical relationship, than lesser or nondiversified firms." (1969, p.79)

Markham (1973), as a part of an extensive analysis of public policy implications, found that, in all multiple regression models relating diversification with various firm-related variables, whenever profitability entered at a significant level, it entered with a negative sign. He employed three different measures of diversification - the number of 4-digit SIC industries a company operated in 1970, the number of diversifying acquisitions a company made in the period 1961-1970, and the ratio of diversifying acquisitions to all acquisitions made during 1961-1970. The profitability measures used were earnings per share and return on assets. His data was drawn from Compustat tapes, Harvard Business School (HBS) multinational enterprise project data, and HBS diversifying company survey data. He speculated that the negative relationship between

diversification and profitability may be due to any or all of the following reasons - acquisitive conglomerates sacrifice profitability for growth while pursuing diversification; companies earning relatively low rates of return in their present industries are the most active acquirers of companies in other industries; or, alternatively, it may simply be that diversification through acquisition in 1961-1970 was not generally an especially profitable activity.

The most recent study in the area was by Rumelt (1974). All the three above studies measured diversification using purely quantitative indexes. As we have already discussed in the section on measurement of diversification, Rumelt's approach to diversification was different. Using his nine category classification of firms based on their diversification strategy, which was discussed earlier, Rumelt found that among a sample of 246 Fortune 500 U.S. corporations, profitability during the period 1960-1969 differed significantly among various categories of firms. He employed several measures of profitability including price earnings ratio of common stock, and after tax return on equity. His analysis indicated that the firms in the dominant-constrained and dominant-linked categories showed the highest mean profitability followed by firms in related-linked, single business and acquisitive

conglomerate categories. Dominant-vertical and unrelated-passive firms were the poorest performers. Summarizing the series of results of his analysis, Rumelt concluded that firms that have diversified to some extent but have restricted their range of activities to a central skill or competence have shown significantly higher rates of profitability than other types of firms.

In his study, Rumelt addressed the question as to why, when no relationship between quantitative measures of diversification and profitability was found by Gort and others, his own analysis showed a significant connection between profitability and diversification classes. He argued that his strategic categories represented managerially meaningful distinctions among corporate diversification postures and that it is not the magnitude of diversity itself - which is what the earlier measures of diversification tended to measure - but rather the way in which the firm related new business to old that is the critical factor in explaining performance differentials. Thus, he commented, a classification system of diversification strategy 'based on the essence of top management's goals and concept of the corporation's purpose and scope is a better predictor of financial performance than simple measures of diversification.' (Rumelt, 1974,

P.150).

### THE PRESENT STUDY

It can be seen from the above review, that the evidence on the issue of diversification and firm profitability is far from conclusive. None of the studies which employed the quantitative measurement approach towards diversification yielded conclusive results. Rumelt's study, on the other hand, did provide some concrete evidence.

Rumelt's study was one of the most comprehensive and carefully conducted studies in the area of corporate diversification. The approach to and classification of diversification strategies proposed by him are indeed very valuable contributions to our understanding of the phenomenon of corporate diversification. In spite of all these merits, it should, however, be noted that Rumelt's results do not concern pure diversity per se. As he, himself, pointed out, 'the categories are actually a crude approximation to a multi-dimensional measure that takes into account several factors in addition to diversity per se.' (1974, p.95). The various qualitative dimensions that determine the category in which a firm was classified included the firm's rationale for diversification, its product mix,

the methods of entry into each business, and the degree to which potential relationships had been exploited. The information on these was obtained by him from numerous sources like annual reports, books, newspapers, magazine articles, and investors' surveys.

Clearly this type of analysis of corporate diversification allows the researcher to make use of all the information available to him - both quantitative and qualitative. However, this richness of the method is bought at the expense of some serious disadvantages. To quote Rumelt again,

.... this type of semisubjective technique has several strengths. .... Of course, these advantages are only obtained by sacrificing a degree of objectivity and replicability. (1974,p.46)

Thus despite all its merits, Rumelt's approach, besides being heavily time consuming and expensive, implies a reluctant, but unavoidable tradeoff with objectivity and replicability. Is it true, as Rumelt leads us to believe, that it is not possible to discern any systematic relationship between corporate diversification and performance, using simple quantitative measures of diversification? If so, researchers are left with no alternative but to follow Rumelt's path. Before discarding the use of

quantitative measures, however, it seems worthwhile examining the shortcomings, if any, that might have weakened the ability of all the studies that employed quantitative measures to discover any relationship between diversification and profitability.

It is possible to pinpoint three significant weaknesses of the studies conducted by Gort, Arnould and Markham. First, all the three employed quantitative measures that failed to recognize separately the related and unrelated components of a firm's total diversification. It may be recalled that, except for the entropy measure of diversification proposed by Jacquemin and Berry (1979), no other quantitative measure of diversification discussed earlier allows the researcher to examine the profit impact of the two components of diversification. As Rumelt's study indicates, related diversification seems to be linked to performance in a systematically different way from the way unrelated diversification does. Jacquemin and Berry (1979) clearly demonstrate, in their study on the relationship between diversification and firm growth, that the use of entropy measure enables to trace out relationships that could not be uncovered when other measures were used. The failure to segregate the two types of diversification may conceivably be an important reason

Why these studies failed to find significant relationships.

Another serious drawback with which all the three studies suffered was the lack of availability of data for accurately measuring diversification. Several researchers who worked in the area of corporate diversification commented on this impediment. Arnould (1969) put it succinctly:

Almost everyone who has worked in the area of diversification and profitability has been more ambitious in endeavours to theorize and speculate on the effects of diversification than in attempting to empirically validate the hypotheses developed from the theorizing. Much of the ambition is lost in attempts to find suitable data. It is difficult to develop such seemingly simple indexes as listings of products produced by different companies at different points in time. Sources are incomplete and inconsistent, and different classifications are used. More desirable information such as output in each productline can be obtained at the cost of incompleteness and undesirable assumptions. These shortcomings are present in the data used in this study. Their extent can only be speculative until adequate data are forthcoming. (1969, p.77)

As data on product line output was not directly available, plant employment and payroll figures were used as surrogates for computing diversification indexes. Clearly, this led to unreliable measures due to the inter-industry differences in wage rates and



labour intensity. The difficulty of obtaining reliable data has been a general problem associated with much of the empirical research in industrial organization. Recently, several new sources of data emerged. These include segment reporting required by FASB (Financial Accounting Standards Board) (1976), line of business reporting program of FTC (Federal Trade Commission) and PIMS (Profit Impact of Market Strategy) data set (1977). Though these data are by no means devoid of limitations, they provide information on individual product lines of business corporations in a standardized and authentic fashion. (For a complete discussion on this issue, see Scherrer (1980, P270-271). Also, for a detailed discussion on the tradeoffs associated with segment data reporting, see Scherrer (1979, p.3-118).) Of all these sources, the most easily accessible and publicly available one is the segment reports required by FASB, as these are included in the annual reports of each corporation.

A third and perhaps most important limitation of the earlier studies on diversification has been the basic approach used in researching the relationship between the variables. All the studies discussed above including the one by Rumelt, analyzed the relationship using a cross-sectional design. One way or the other, they attempted to test the hypotheses concerning the

relationship between diversification and performance by comparing across firms at a point in time, the performance achieved by a group of highly diversified firms with that of a group of less diversified firms. There is a clear weakness in this approach. The expectation of the theory seems to be that a firm will be able to 'improve' its performance over time through diversification. Thus the variable of interest is change in profitability over time rather than absolute profitability at a point in time. The latter is influenced by numerous factors of which diversification is only one. A cross-sectional comparison at a point in time fails to provide any control for these factors. However, if we compare across firms, the growth rate in profitability over a period of time, we will be able to control for the factors which are firm specific and remain relatively constant over the period of analysis. Comments of Gort and Arnould on the possible reasons behind their failure to uncover significant relationships, which were quoted earlier, point to this very same reasoning. When we look at the possible motives of firms wishing to diversify, there seem to be two broad classes. A firm, which at present is performing well, may seek to diversify in order to exploit exceptional opportunities to earn still better profits. Another firm may seek diversification primarily as a means to improve its present below

average or poor performance. The absolute level of profitability of the former might be far different (both prior to and subsequent to diversification) from the absolute profitability of the latter. However, in both the cases, diversification might result in similar growth rate of profitability. A test that attempts to trace the relationship by looking at the absolute levels of returns will fail to discover any relationship due to the averaging effect. This apparent lack of relationship however does not mean that there exists no relationship between diversification and performance. The relevant measure of performance here is clearly the change in profitability (in relation to the absolute prior level) and not absolute level itself. Perhaps this is the most important reason why Gort and Arnould failed to uncover any relationship when they correlated diversification and profitability without explicitly considering other factors.

### Hypotheses

The main aim of the present study is to take a fresh look at the relationship between diversification and profit performance of firms, using quantifiable measures. An attempt has been made to remedy the three limitations discussed above, of the earlier studies by

taking advantage of the recent developments in measurement of diversification as well as of data availability. Through a sequential process of testing three different pairs of hypotheses, an attempt has been made to successively eliminate the three limitations discussed above. It is hoped that this logical, albeit elaborate, analysis helps us to understand the role each limitation played in the results of earlier studies.

The first pair of hypotheses essentially reflect the propositions tested by Gort, Arnould and Markham. These hypotheses derive their support from the theory of industrial organization which suggests that a highly diversified firm is in a position to earn super normal profits. This study proposes essentially to replicate the earlier studies in this respect using a superior data set for measuring diversification.

The first pair of hypotheses can be stated as:

H1 : Level of total diversification is positively related to the level of profitability across firms.

H1': On the average, the profitability of firms with relatively high level of total diversification is greater than the profitability of firms with relatively low level of diversification.

It should be noted that H1' is a restatement of H1 in a differently testable form.

A second set of hypotheses seeks to introduce the distinction between related and unrelated diversification. The hypotheses themselves are based directly on the results of Rumelt's study. Briefly, the thrust of the argument is that it is not merely diversification itself but the way the different businesses that span this diversity are related to one another that influences the performance consequences. This is demonstrated by the argument that synergy, the principal alleged reason for the improved profitability of diversified firms, occurs only when the new businesses are somehow related to the old ones. Thus there is strong reason to believe that the firms with higher related diversification do better than firms with high unrelated diversification. As Rumelt's study points out, a diversification strategy without a common and coherent theme may in fact lead to poorer performance. Also, looking at the relationship from the other side of causality, it can be argued that a better performing firm is less likely to diversify 'away' from its existing lines of business and that it is mostly those firms that find their existing businesses to be unprofitable that seek highly unrelated diversification. This argument leads us to the

following pair of (equivalent) hypotheses:

H2 : Levels of related and unrelated diversification are respectively positively and negatively related to the average profitability across firms.

H2': On the average, the profitability of firms with relatively high related diversification is greater than the profitability of firms with relatively high unrelated diversification

The above set of hypotheses effectively address two of the three limitations discussed earlier. However, the third and perhaps more serious limitation, namely, using the absolute level of profitability rather than the growth rate in profitability as a performance measure, still needs to be addressed. The third set of hypotheses suitably modifies the second set to address this issue. We shall not repeat the arguments in support of these as they have been stated at length earlier. The hypotheses themselves can be stated as follows:

H3 : Levels of related and unrelated diversification are respectively positively and negatively related to the growth rate of profitability across firms.

H3': On the average, the profitability growth rate of firms with relatively high related diversification is greater than the growth rate of firms with relatively high unrelated diversification.

We have already discussed earlier the issues involved in the measurement of diversification. This study employed the entropy measure of diversification. As discussed already, this is the only measure available that allows us to separately measure 'related' and 'unrelated' diversification. For the purpose of this study, related diversification has been defined as diversification into different SIC 4-digit industries within a 2-digit industry group; unrelated diversification has been defined as diversification across different SIC 2-digit industry groups. The measures of related, unrelated and total diversification that have been used are:

$$\begin{aligned}
 DR_s &= \sum_{i \in S} P_{is} \cdot \ln(1/P_{is}), \\
 DU_s &= P_s \cdot \ln(1/P_s), \\
 DR &= \sum_s P_s \cdot DR_s, \\
 DU &= \sum_s DU_s, \text{ and} \\
 DT &= DR + DU
 \end{aligned}$$

where,

$P_{is}$  is the share of the  $i$ th 4-digit industry in the firm's

$s$ th 2-digit industry group's total sales,

$P_s$  is the share of the  $s$ th 2-digit industry group in the

firm's total sales,

$DR_s$  is the related diversification contributed by the  $s$ th

2-digit industry group,

$DU_s$  is the unrelated diversification contributed by the  $s$ th

2-digit industry group,

$DR, DU, DT$  are the overall related, unrelated, and total diversification of the firm.

Profitability of a firm can be defined in any one of several ways. For the purpose of this study, the measure chosen was the return on owners equity (ROE) computed as the net profit (after taxes and dividend on preferred stock but before extraordinary items) as a percentage of shareholders' equity. Profitability in a given year is computed as the average return on equity over the preceding ten year period including that year. (For example, profitability for the year 1973 is defined as the average ROE over the ten year period 1964-1973).

Profitability growth rate between two years has been computed as the percentage increase in profitability from the base year to the final year. Thus if P73 is the profitability index for the year 1973 and P79 is the profitability index for 1979, the profitability growth rate has been defined as:

$$PG(79:73) = 100 * (P79 - P73) / P73$$

#### Data and Computation of Measures

The present study uses a sample of 30 companies from the Food Products industry group (SIC industry group 20). Diversification indexes were computed using segment sales data as reported by the companies and



compiled by Standard and Poor on their Business Segment Compustat tape. Profitability index and profitability growth rate index were computed using data reported by the companies as compiled by Standard and Poor on their expanded annual industrial compustat tape. The period covered by the study was 1973-1979, the years for which for which segment sales data was publicly available.

As briefly mentioned earlier, FASB (Financial Accounting Standards Board) statement no.14 requires that the annual financial statements of all business enterprises prepared in conformity with generally accepted accounting principles include information related to the enterprise's operations in different industries. Included in the required information to be reported are revenue, operating profit or loss, and identifiable assets of each of the business segments of an enterprise. Segments are defined by a firm's management such that each represents at least ten percent of combined revenue, profit/loss or assets either during the current or preceding year. The factors required to be considered while grouping products into segments are the nature of the product, the nature of the production process, and the markets and marketing methods used in the case of each product. The segment reporting requirement came into effect beginning December 15, 1976. All companies which were

registered with the SEC were required to report similar information in their 10-K reports to the SEC.

Standard and Poor's Business Information Compustat II tape includes an industry segment file containing the data reported by firms in accordance with FASB 14. The file contains up to seven years of information for each company, the period covered at present being 1973-1979. Each year for which data was available for a company, there are up to ten records of industry segment data, with each industry segment record providing information on a particular industry segment. Each record contains data on up to four principal products of the industry segment. Each segment is assigned an SIC code. Whereever it was not possible to classify a segment into only one SIC code, two SIC codes that best describe the activities of the segment were assigned. For each of the principal products listed, its SIC code and sales data were available. For a more detailed description of the data and the tape, the reader is referred to Standard and Poor's Compustat Services' manual on Business Information Compustat II.

Diversification indexes were computed for each company for each year using the SIC codes and Sales data for each of the principal products of the company. In a few cases, when an industry segment of a firm consisted

of only one principal product and it was not possible to assign a unique SIC code to that segment, the sales were split equally between the two SIC codes assigned for that segment. The sensitivity of the final results to this allocation assumption was tested by replicating the analysis using another rule by which sales were split in the proportion of ninety percent to ten percent between the two SIC codes. It was found, as a result of this test, that the sensitivity of the results to the allocation rule was insignificant.

Data for the computation of profitability measures were drawn from the expanded annual industrial Compustat tape. First, return on equity for each of the companies for each year during the period 1964-1979 was computed. Then ten year moving average ROE for each of the years from 1973-1979 (as indicated earlier) was computed. The moving average, rather than yearly ROE, was chosen for use as the profitability index with a view to eliminate some of the noise in the accounting numbers. The sensitivity of the final results to the choice of ten year period for computation of the moving average was later tested by using five year averages in the place of ten year averages. The results were found to be robust with respect to the choice.

Profitability growth rates were computed for the years

1974-1979 using 1973 as the base year. Once again, in order to ensure that the choice of the base year did not determine the pattern of final results, growth rates were computed using 1974 as the base year. The pattern of final results was found to be same with either base year.

The statistical analysis presented in the following sections is confined to the Food Products industry group. It was felt that the sample for investigation should be drawn from a single industry so that industry-specific effects can be controlled for in the analysis. The choice of the food industry itself was random. In order to check whether the results obtained in this study were purely a function of the industry choice or they hold beyond the industry analysed, a similar analysis was carried out on a sample of 34 firms from the Drugs and Chemicals (SIC code 28) industry group. Due to lack of space, the complete results of this parallel analysis were not reported in this paper. However, suffice it to say that all the results that were found in this study are were found to equally hold well in the Drugs and Chemicals industry group. Though this does not ensure external validity of the findings reported here, it does provide a source of confidence to claim that the results are not peculiar to the food industry alone.

Data requirements for computing the diversification and profitability indexes for all seven years 1973 through 1979 limited the sample size to 30 firms. It should be noted that meeting the data requirements was the only criterion employed in choosing the sample. Thus the sample is not random in the probabilistic sense. Any biases that may have resulted due to this could not be avoided.

### Statistical Methods

For the purpose of analysing the data and testing the postulated hypotheses discussed earlier, two types of techniques were employed. The parametric techniques used were Pearson's product-moment correlation for measurement of association and the t-test for testing the equality of means. These parametric techniques require rather stringent assumptions regarding the nature of the data (that is, whether the data is nominal, ordinal or interval in nature), and its distributional properties (that is, the probability distribution of the population from which the data has been drawn). The problem becomes severe especially when the sample size is rather small, as happens to be the case here. The conclusions that emerge from such analysis are thus subject to qualifications like, 'if the assumptions regarding the nature of the data, and

the shape of the population distribution are valid, then we may conclude ....' . Nonparametric techniques, on the other hand, usually require only ordinal data or nominal data - clearly an easier requirement to meet - and are distribution-free. With a view to compliment the parametric analysis, several non-parametric tests were also conducted. These include Spearman's rank correlation, the median test, the Mann-Whitney U test, and finally, the Wald-Wolfowitz runs test. (For an excellent discription of these tests, see Seigel, 1956).

## Results

### Hypotheses H1 and H1'

The Pearson product moment-correlation matrix between profitability indexes for the years 1973 through 1979 (denoted as P73 through P79) and total diversification index for the same year (denoted as DT73 through DT79) is shown in Table 1. The Spearman rank-correlation matrix for the same variables is shown in Table 2. It can be seen that none of the correlation coefficients in either table are significant. Thus, the results do not support the proposition in H1.

A t-test was carried out to examine whether proposition

in H1' is true. The sample was split into two groups on the basis of the level of DT73. Firms with value of DT73 above the sample median were classified as the 'High DT73' group and those with DT73 below the sample median were classified as 'Low DT73' group. A t-test was then carried out to see if the mean profitability either in 1973 or in 1979 was different between the two groups, the direction of difference being as postulated in H1'. The results of the test are shown in Table 3. The test does not allow us to reject the null hypothesis that the mean profitability of the two groups either in 1973 or in 1979 are not significantly different from each other.

Three nonparametric tests were performed on the 'High DT73' and 'Low DT73' groups to supplement the t-test. Two of these tests - the median test and the Mann-Whitney U test - were meant to test whether the two groups represent populations which differ in their central tendency. Wald-Wolfoowitz runs test was to determine whether the two samples are from populations which differ in any respect at all, i.e., in location, dispersion or skewness. The results of the tests are shown in Table 3. None the three tests supported the proposition as postulated in H1'.

In conclusion, then, the results do no support either

H1 or H1'. No significant correlation was found to exist between total diversification in any given year and the profitability in the same or any of the subsequent years. Similarly, no significant correlation was found to exist between profitability in a given year and total diversification in the same or any of the subsequent years. Also, when the sample was split into the high and the low groups on the basis of their 1973 total diversification, no significant difference was found to exist between the two in terms of their profitability either in 1973 or in 1979.

#### Hypotheses H2 and H2'

Correlation matrices showing the Pearson product-moment correlation and the Spearman rank-correlation between profitability for the years 1973-1979 (denoted as P73 through P79), and related and unrelated diversification indexes for the same period (denoted respectively DR73-DR79 and DU73-DU79) are shown in Table 4, Table 5, Table 6 and Table 7. Once again, all the correlation coefficients were statistically insignificant. The relationships expected in H2 were, thus, not substantiated by the results.

The sample was split into four groups on the basis of high and low 1973 related and unrelated diversification



as shown in Table 8. This table shows the number of companies, the mean 1973 profitability, and the mean 1979 profitability for each of the four cells. Interestingly, most of the observations fell into the two cells, 'High DR73 - Low DU73' and 'Low DR73 - High DU73'. The other two cells contained only two observations each. Further analysis of the data, hence, was confined only to the two 'High - Low' cells.

In order to examine whether H2' holds, four tests were conducted. A t-test was carried out to see whether the mean profitability of the 'High DR73 - Low DU73' group was higher than that of the 'Low DR73 - High DU73' either in 1973 or in 1979. The median test, the Mann-Whitney U test, and the Wald-Wolfowitz runs test were also conducted. In none of the tests was it possible to reject the null hypothesis that there is no significant difference in the profitability of the two groups either in 1973 or in 1979. The results of these tests are summarized in Table 9.

The above tests, once again, fail to support the hypotheses H2 and H2'. Results indicate that, the firms in the sample chose either high related diversification or high unrelated diversification. Very few firms chose either both or none. Thus, in

1973, the sample consists of two basic sub-groups - those with predominately related diversification or those with predominantly unrelated diversification. It seems that firms in the sample treated the two types of diversification strategies as mutually exclusive choices. However, in terms of profitability, the two groups did not differ significantly either in 1973 or seven years later, in 1979. Also, no significant correlation between profitability in a given year and diversification of either kind in that year or subsequent years, or vice versa, seems to exist.

#### Hypotheses H3 and H3':

Hypothesis H3 was first tested using 1973 as the base year in computing the growth rate in profitability. The product moment correlations and the Spearman rank order correlations of profit growth rates for the period 1974-1979 (denoted as PG(74:73) through PG(79:73) ) with the total, related, and unrelated diversifications (denoted as DT73, DR73 and DU73) in 1973 were computed and are shown in Table 10 and Table 11.

The results in these two tables show interesting patterns. The correlation between DT73 with profitability growth rate in all the years is positive

but insignificant. However, when DT73 was decomposed into DR73 and DU73, the correlations become highly significant. As postulated in H3, profitability growth rate is positively correlated with DR73, and negatively correlated with DU73.

Three tests were carried out in order to examine the validity of H3'. As in the case of tests for H2', the sample was split into four groups and the analysis was focussed on 'High DR73 - Low DU73' and 'Low DR73 - High DU73' groups. The t-test indicated that the the mean prfoitability growth rate of the former group is higher than that of the latter at 0.005 level of significance. The median test and the Mann-Whitney test led to the same conclusion at 0.01 level of significance. In the light of such strong evidence in support of H3', the Wald-Wolfowitz runs test, which tests a weaker form of H3', was considered superflous. The results of these tests have been summarized in Table 12.

The above analysis conclusively supports H3 and H3'. It further demonstrates that relationships, which were found to be highly significant, might not be exhibited if the analysis is carried out at the level of total diversification rather than at the disaggregated level of related and unrelated diversification.

Further Exploration of H3 and H3':

An Examination of Table 8 shows that the mean profitability in 1973 for the 'High DR73 -Low DU73' was lower than that for the 'Low DR73 - High DU73' group. Though this difference was not found to be significant in our earlier tests, there is a possible doubt that the positive growth rate of the former group and the negative growth rate of the latter might be nothing but the classical 'regression to the mean.' (For a discussion on this, see Campbell and Stanley, 1963, pp.10-12.) A test was carried out to see if this indeed was the case.

Table 13 shows a recast of the data in a 2x2 table. The 'High DR73 - Low DU73' group was split into two subgroups, one subgroup consisting of firms whose profitability in 1973 was below the sample median, and the other consisting of firms with profitability above the median. The 'Low DU73 - High DR73' was similarly split into two subgroups. If our hypothesis that the growth rates observed were indeed a result of the regression to the mean phenomenon is true, then the two subgroups with 'Low' 1973 profitability should have growth rates which do not significantly differ from each other. On the other hand, if diversification was associated with the growth rates as proposed in H3 and

H3', then, the profitability growth rate of the 'Low P73 - High DR73 - Low DU73' subgroup should be significantly greater than that of the 'Low P73 - Low DR73 - High DU73' subgroup. The results of a t-test led us to reject the mean reversion hypothesis in favour of the other hypothesis at a significance level of .05. Similar result was found to hold in the case of the other two subgroups. Thus, clearly, the growth rates were not a mere mean reversion phenomenon and there seems to be evidence to strongly support hypotheses H3 and H3'.

#### DISCUSSION AND CONCLUSIONS

The results presented in the previous section fail to support the first two sets of our hypotheses. They do, however, provide rather strong evidence in favour of H3 and H3'. Given the logical reasoning that led to the development of three sets of hypotheses, this is not surprising. We have argued that the earlier studies in this area suffered from three major limitations. Our first set of hypotheses addresses only one of these and is subject to the remaining two limitations. The second set still suffers from one of the limitations while having dealt with the other two of them. It is only the third set that fully addressed all the three limitations. The results seem to indicate that all the

three shortcomings need to be eliminated before significant relationships between diversification and profitability could be traced out. The failure of the earlier studies, just like the failure of our first two sets of hypotheses, to find such relationships does not stem from the fact that they used 'simple quantitative measures' of diversification as Rumelt seems to suggest, for, our results do indeed support the relationships proposed in H3 and H3'. Instead, the earlier studies, as also our first two sets of hypotheses, seem to have failed because they suffered from one or more of the limitations, namely, failure to segregate related and unrelated diversification, a simple cross sectional analysis employing absolute profitability levels, and having to use of not-so-reliable data.

Our results indicate that the firms with high related diversification (DR) in 1973 achieved, on an average, significantly larger profitability growth rates than the firms with high unrelated diversification (DU) did. In fact, the average profitability growth rate of the latter group was negative. This implies that, all else remaining the same, the former group would outperform the latter in terms of absolute profitability, given sufficient time. Our analysis also shows that the absolute profitability of the two groups did not

significantly differ both in 1973 and in 1979. A closer look at the figures in Table 8 shows that in 1973, the mean profitability of the 'High DR73-Low DU73' group was 13.36 per cent while that of the 'Low DR73-High DU73' group was 14.25 percent. In 1979 the two values were 14.57 per cent and 12.64 per cent respectively. Thus there seems to be a movement of the mean profitability of the two groups in the expected direction though it was not significant. There could be two reasons behind this - either the association between diversification and profitability growth rate was not strong enough to produce significant changes over a period of seven years or else, there was some other counter-association acting to dampen the changes expected.

In order to gain a further understanding into the issue, one final analysis was performed. The sample was split into two groups, the 'High P73' group consisting of the firms with 1973 profitability above the sample median and the 'Low P73' group consisting of the firms with 1973 profitability below the sample median. The percentage change from 1973 to 1979 of the mean diversification -total (DT), related (DR), and unrelated (DU) - for the two groups were computed and has been summarized in Table 14. The mean DT increased in the case of both the groups. However, the growth

rate in the case of the 'High P73' group was about twice that of the 'Low P73' group, indicating that far more diversification took place in more profitable firms than in less profitable firms.

Let us now examine the composition of this change in total diversification of the two groups. We notice that the 'Low P73' group experienced diversification growth that was predominantly related in nature. The 'High P73' group, on the other hand, had about equal growth in mean related diversification and mean unrelated diversification, the unrelated diversification being a little larger. If we compare the diversification growth pattern between the two groups, we also notice that the growth rate in mean related diversification of the two is quite comparable; but the growth rate in mean unrelated diversification of the more profitable group was about four times that of the less profitable group. This analysis, thus, indicates that the more profitable firms in general undertook far more diversification than the less profitable firms during the seven year period under study and that in particular, the former undertook far more unrelated diversification than the latter. If we combine this conclusion with our earlier observations, interesting conclusions seem to emerge.



The nature of interaction between diversification and profitability that we can conjecture from the above analysis is represented in a diagrammatic form in Figure 1. Briefly it can be described as follows. High related diversification is associated with high profitability growth rate which leads to high absolute profitability levels in due course of time. High profitability levels, in turn, seem to be associated with high unrelated diversification. However, as we have seen, high unrelated diversification is negatively associated with growth rates in profitability. This process would then dampen the growth rates in profitability resulting from the original high related diversification level. If this complex process of mutual causation occurs simultaneously, as seems to be the case, the actual differential between the levels of profitability of the high DR and high DU groups would be smaller than could be expected from a simple association between diversification and profitability growth rates.

The interaction between profitability and diversification seems to be too complex and dynamic to be captured by a simple static analysis. The present study attempted to take cognisance of this by studying the relationship of diversification with changes in profitability rather than with its absolute level. The

results that emerged indicate that such an approach could be quite fruitful.

We do not pretend to have captured the complete richness of the process of interaction between diversification and profitability. We did, however, successfully demonstrate that it is possible to trace out relationships in this area using quantitative measures of diversification. This study is a small but useful beginning. It is for future research to explore and extend the issues raised by this study.

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TABLE 1

PEARSON PRODUCT MOMENT CORRELATION  
BETWEEN TOTAL DIVERSIFICATION AND PROFITABILITY

	P73	P74	P75	P76	P77	P78	P79
DT73	-0.130	-0.139	-0.113	-0.138	-0.120	-0.014	-0.016
DT74	-0.124	-0.128	-0.105	-0.133	-0.118	-0.021	-0.026
DT75	-0.087	-0.090	-0.064	-0.106	-0.084	0.019	-0.003
DT76	-0.013	-0.018	-0.003	-0.041	-0.091	0.085	0.063
DT77	0.051	0.029	0.024	-0.004	0.031	0.160	0.142
DT78	0.046	0.025	0.019	-0.031	0.000	0.119	0.099
DT79	0.028	-0.006	-.017	-0.063	-0.027	0.095	0.077

Note: The critical value of the correlation coefficient at 0.05 level of significance is 0.306

TABLE 2

SPEARMAN RANK ORDER CORRELATION  
BETWEEN TOTAL DIVERSIFICATION AND PROFITABILITY

	P73	P74	P75	P76	P77	P78	P79
DT73	-0.180	-0.174	-0.153	-0.148	-0.127	-0.098	-0.094
DT74	-0.199	-0.188	-0.174	-0.168	-0.152	-0.199	-0.111
DT75	-0.173	-0.164	-0.151	-0.150	-0.131	-0.097	-0.095
DT76	-0.122	-0.119	-0.110	-0.117	-0.098	-0.075	-0.074
DT77	-0.016	-0.039	-0.049	-0.065	-0.031	-0.005	-0.002
DT78	-0.013	-0.036	-0.051	-0.069	-0.039	-0.017	-0.012
DT79	-0.007	-0.034	-0.047	-0.065	-0.037	-0.018	-0.009

Note: The critical value of the correlation coefficient at a significance level of 0.05 is 0.306

TABLE 3

RESULTS OF TESTS FOR H1'

TEST	STATISTIC	1973 VALUE	1979 VALUE	CRITICAL VALUE*
1. t-TEST	t	-1.55	-1.19	1.70
2. MEDIAN TEST	$\chi^2$	0	0	2.71
3. MANN-WHITNEY U TEST	U	96	97	72
4. WALD-WOLFOWITZ RUNS TEST	r	12	14	10

\* Table Value at a level of significance of 0.05

NOTE:

- I. The null hypothesis in test 1 was that the mean profitability of 'High DT73' group was equal to the mean profitability of 'Low DT73' group. The alternative hypothesis was that the mean profitability of the former group was higher than that of the latter.
- II. The null hypothesis for tests 2 and 3 was that the median profitability of 'High DT73' group was equal to the median profitability of the 'Low DT73' group. The alternative hypothesis was that the median profitability of the former was higher than that of the latter.
- III. The null hypothesis for test 4 was that the distributions of profitability of the 'High DT73' group and the 'Low DT73' groups did not differ at all. The alternative hypothesis was that they differ in some respect.

TABLE 4

PEARSON PRODUCT MOMENT CORRELATION  
BETWEEN RELATED DIVERSIFICATION AND PROFITABILITY

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	P73	P74	P75	P76	P77	P78	P79
DR73	-0.200	-0.149	-0.092	-0.067	-0.035	0.025	0.084
DR74	-0.220	-0.166	-0.115	-0.090	-0.064	-0.001	0.058
DR75	-0.204	-0.151	-0.101	-0.078	-0.049	0.012	0.066
DR76	-0.204	-0.149	-0.096	-0.073	-0.042	0.020	0.074
DR77	-0.099	-0.075	-0.042	-0.027	0.024	0.088	0.149
DR78	-0.105	-0.081	-0.050	-0.035	0.015	0.080	0.142
DR79	-0.121	-0.093	-0.060	-0.045	0.003	0.065	0.123

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Note: The critical value of the correlation coefficient at 0.05 significance level is 0.306



TABLE 5

SPEARMAN RANK ORDER CORRELATION  
BETWEEN RELATED DIVERSIFICATION AND PROFITABILITY

---

	P73	P74	P75	P76	P77	P78	P79
DR73	-0.154	-0.104	-0.043	-0.070	0.002	0.098	0.187
DR74	-0.199	-0.146	-0.089	-0.121	-0.053	0.045	0.142
DR75	-0.175	-0.121	-0.061	-0.096	-0.023	0.076	0.165
DR76	-0.147	-0.093	-0.035	-0.069	0.010	0.107	0.190
DR77	-0.073	-0.055	-0.028	-0.058	0.065	0.204	0.292
DR78	-0.091	-0.074	-0.056	-0.088	0.030	0.178	0.271
DR79	-0.111	-0.084	-0.054	-0.081	0.039	0.178	0.273

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Note: The critical value of the correlation coefficient at a significance level of 0.05 is 0.306

TABLE 6

PEARSON PRODUCT MOMENT CORRELATIONS  
BETWEEN UNRELATED DIVERSIFICATION AND PROFITABILITY

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	P73	P74	P75	P76	P77	P78	P79
DU73	0.030	-0.016	-0.053	-0.073	-0.085	-0.118	-0.174
DU74	0.028	-0.019	-0.059	-0.079	-0.091	-0.112	-0.177
DU75	0.038	-0.013	-0.055	-0.081	-0.093	-0.124	-0.185
DU76	0.088	0.033	-0.014	-0.047	-0.061	-0.103	-0.161
DU77	0.086	0.033	-0.014	-0.047	-0.061	-0.099	-0.155
DU78	0.094	0.041	-0.009	-0.046	-0.063	-0.103	-0.162
DU79	0.119	0.058	0.008	-0.029	-0.046	-0.090	-0.140

---

Note: The critical value of the correlation coefficient at 0.05 significance level is 0.306

TABLE 7

SPEARMAN RANK ORDER CORRELATION  
BETWEEN UNRELATED DIVERSIFICATION AND PROFITABILITY

---

	P73	P74	P75	P76	P77	P78	P79
DU73	0.123	0.053	-0.017	0.002	-0.047	-0.052	-0.161
DU74	0.122	0.055	-0.015	0.004	-0.046	-0.051	-0.161
DU75	0.148	0.084	0.014	0.025	-0.024	-0.023	-0.156
DU76	0.159	0.098	0.033	0.025	-0.031	-0.021	-0.145
DU77	0.144	0.085	0.020	0.010	-0.048	-0.038	-0.157
DU78	0.161	0.101	0.034	0.014	-0.048	-0.045	-0.170
DU79	0.189	0.118	0.050	0.031	-0.026	-0.015	-0.141

---

Note: The critical value of the correlation coefficient at 0.05 level of significance is 0.306

TABLE 8

LOW DU73

HIGH DU73

LOW DR73	NUMBER OF FIRMS	2	NUMBER OF FIRMS	13
	MEAN P73	13.37	MEAN P73	14.25
	MEAN P79	13.46	MEAN P79	12.64
HIGH DR73	NUMBER OF FIRMS	13	NUMBER OF FIRMS	2
	MEAN P73	13.36	MEAN P73	10.40
	MEAN P79	14.57	MEAN P79	12.05

TABLE 9

RESULTS OF TESTS FOR H2'

TEST	STASTIC	VALUE 1973	VALUE 1979	CRITICAL VALUE*
1.t.Test	t	-0.465	0.999	1.708
2.Median Test	$\chi^2$	0.155	1.393	2.71
3.Mann-Whitney U Test	U	70	62	51
4.Wald-Wolfowitz Runs Test	r	10	12	8

NOTES:

1. The null hypothesis in test 1 was that the mean profitability of the 'High DR73 - Low DU73' group was equal to the mean profitability of the 'Low DR73 - High DU73' group. The alternative hypothesis was that the mean profitability of the former group was higher than that of the latter. The null hypothesis could not be rejected at 0.05 level of significance.
2. The null hypothesis in tests 2 and 3 was that the median profitability of the 'High DR73 - Low DU73' group was equal to that of the 'Low DR73 - High DU73' group. The alternative hypothesis was that the median profitability of the former group was higher than that of the latter. The null hypothesis could not be rejected at a level of significance 0.05.
3. The null hypothesis in test 4 was that the distributions of profitibility of the 'High DR73 - Low DU73' group and the 'Low DR73 - High DU73' group did not differ at all. The alternative hypothesis was that they differ at least in some respect. The null hypothesis could not be rejected at 0.05 level of significance.

TABLE 10

PEARSON PRODUCT MOMENT CORRELATION  
BETWEEN TOTAL, RELATED AND UNRELATED DIVERSIFICATION AND PROFIT GROWTH RATE

	DT73	DR73	DU73
PG(74:73)	0.052 <sup>ns</sup>	0.338 <sup>**</sup>	-0.290 <sup>*</sup>
PG(75:73)	0.121 <sup>ns</sup>	0.406 <sup>***</sup>	-0.292 <sup>*</sup>
PG(76:73)	0.104 <sup>ns</sup>	0.398 <sup>***</sup>	-0.300 <sup>*</sup>
PG(77:73)	0.155 <sup>ns</sup>	0.437 <sup>***</sup>	-0.292 <sup>*</sup>
PG(78:73)	0.198 <sup>ns</sup>	0.493 <sup>****</sup>	-0.306 <sup>*</sup>
PG(79:73)	0.175 <sup>ns</sup>	0.539 <sup>*****</sup>	-0.374 <sup>**</sup>

- ns - Not significant
- \* - Significant at 0.10 level (The critical value at this level is .260)
- \*\* - Significant at 0.05 level (The critical value at this level is .330)
- \*\*\* - Significant at 0.025 level (The critical value at this level is .388)
- \*\*\*\* - Significant at 0.005 level (The critical value at this level is .453)
- \*\*\*\*\* - Significant at 0.001 level (The critical value at this level is .496)

TABLE 11

SPEARMAN RANK ORDER CORRELATION  
BETWEEN TOTAL, RELATED AND UNRELATED DIVERSIFICATION AND PROFIT GROWTH RATE

	DT73	DR73	DU73
PG(74:73)	0.020 <sup>ns</sup>	0.341 <sup>**</sup>	-0.322 <sup>*</sup>
PG(75:73)	0.099 <sup>ns</sup>	0.397 <sup>***</sup>	-0.304 <sup>*</sup>
PG(76:73)	0.128 <sup>ns</sup>	0.364 <sup>**</sup>	-0.244 <sup>ns</sup>
PG(77:73)	0.115 <sup>ns</sup>	0.451 <sup>***</sup>	-0.343 <sup>**</sup>
PG(78:73)	0.143 <sup>ns</sup>	0.462 <sup>****</sup>	-0.328 <sup>*</sup>
PG(79:73)	0.164 <sup>ns</sup>	0.481 <sup>****</sup>	-0.326 <sup>*</sup>

ns - Not significant  
 \* - Significant at 0.10 level (The critical value at this level is 0.260)  
 \*\* - Significant at 0.05 level (The critical value at this level is 0.330)  
 \*\*\* - Significant at 0.025 level (The critical value at this level is 0.388)  
 \*\*\*\* - Significant at 0.01 level (The critical value at this level is 0.496)

TABLE 12

RESULTS OF STATICAL TESTS FOR H3

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TEST	STASTIC	COMPUTED VALUE	CRITICAL VALUE	SIGNIFICANCE LEVEL
1.t-Test	t	3.615	2.797	0.005
2.Median Test	X <sup>2</sup>	5.538	5.410	0.01
3.Mann-Whitney U Test	U	35	39	0.01

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NOTES:

1. The null hypothesis in test 1 was that the mean profit growth rate of the 'High DR73 - Low DU73' group and that of the 'Low DR73 - High DU73' group were equal. The Alternative hypothesis was that the mean profitability growth rate of the former group was larger than that of the latter. The null hypothesis was rejected at 0.005 level of significance.
2. The null hypothesis in tests 2 and 3 was that the median profitability growth rate of the 'High DR73 - Low DU73' group was equal to that of the 'Low DR73 - High DU73' group. The alternative hypothesis was that the median profitability growth rate of the former group was higher than that of the latter. The null hypothesis could be rejected at 0.01 level of significance in both the tests.



TABLE 13

	HIGH DR73-LOW DU73	LOW DR73-HIGH DU73
LOW P73	Number of Firms 7 Mean PG(79:73) 11.5*	Number of Firms 5 Mean PG(79:73) -9.19*
HIGH P73	Number of Firms 6 Mean PG(79:73) 7.62@	Number of Firms 8 Mean PG(79:73) -11.33@

\* These two values were found to be significantly different in a one tailed test at 0.05 level of significance.

@ These two values were found to be significantly different in a one tailed test at 0.025 level of significance.

TABLE 14

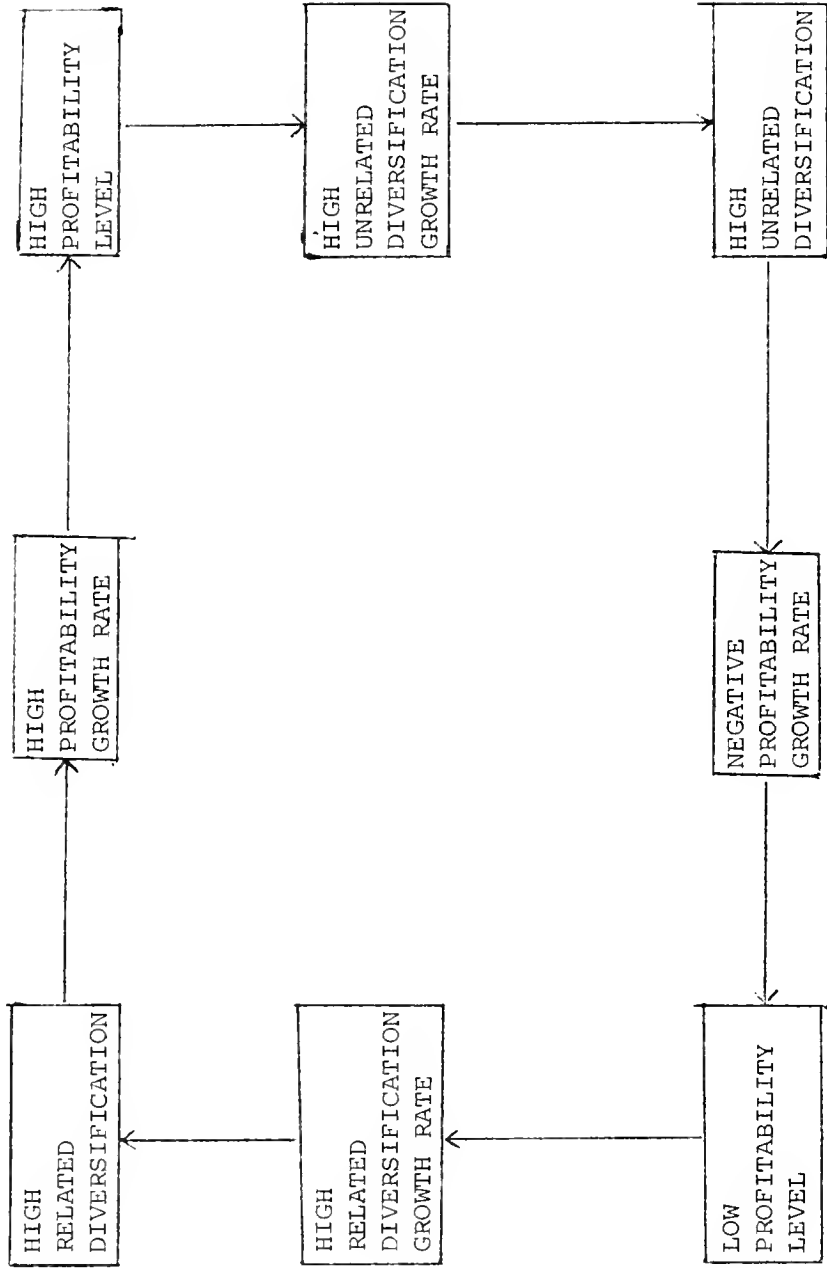
PERCENTAGE CHANGES IN MEAN DIVERSIFICATION  
DURING THE PERIOD 1973-1979

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GROUP	DT	DR	DU
LOW P73	7.16	10.33	4.52
HIGH P73	15.79	14.42	16.90

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F I G U R E 1





CRITERION TYPE	SR	VR	RR	OTHER
SINGLE BUSINESS	$\geq 0.95$	-	-	-
DOMINANT VERTICAL	$< 0.95$	$\geq 0.7$	-	-
DOMINANT UNRELATED	$0.95-0.7$	$< 0.7$	$0.5(SR+1)$	-
DOMINANT CONSTRAINED	$< 0.7$	$< 0.7$	$0.5(SR+1)$	DIVERSIFICATION BUILDING ON SOME CENTRAL STRENGTH
DOMINANT LINKED	$< 0.7$	$\sim 0.7$	$0.5(SR+1)$	DIVERSIFICATION BUILDING ON A SET OF STRENGTHS
RELATED CONSTRAINED	$< 0.7$	$< 0.7$	$\geq 0.7$	DIVERSIFICATION BUILDING ON SOME CENTRAL STRENGTH
RELATED LINKED	$< 0.7$	$< 0.7$	$\geq 0.7$	DIVERSIFICATION BUILDING ON A SET OF STRENGTHS
UNRELATED PASSIVE	$< 0.7$	$< 0.7$	$\sim 0.7$	-
CONGLOMERATES	$< 0.7$	$< 0.7$	$\sim 0.7$	AT LEAST 10% EPS GROWTH RATE OVER PAST FIVE YEARS AT LEAST 5 ACQUISITIONS OVER PAST FIVE YEARS MARKET VALUE OF NEW EQUITY ISSUED OVER PAST FIVE FIVE YEARS GREATER THAN TOTAL COMMON DIVIDEND

## NOTE:

SR - SPECIALIZATION RATION, THE PROPORTION OF THE FIRM'S REVENUE FROM ITS LARGEST SINGLE BUSINESS  
RR - RELATED RATIO, THE PROPORTION OF THE FIRM'S REVENUE ATTRIBUTABLE TO ITS LARGEST GROUP OF RELATED BUSINESSES  
VR - VERTICAL RATIO, THE PROPORTION OF THE FIRM'S REVENUE THAT ARISES FROM ALL BY-PRODUCTS, INTERMEDIATE  
PRODUCTS AND END PRODUCTS OF A VERTICALLY INTEGRATED CHAIN











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